

METHOD AND APPARATUS FOR EFFICIENT DETERMINATION OF CHANNEL ESTIMATE AND BAUD FREQUENCY OFFSET ESTIMATE

ABSTRACT

A method and apparatus for obtaining a channel estimate and a baud frequency offset estimate for a communications channel in a communications system. The communications system has a transmitter for transmitting to a receiver over the communications channel signals representing data appended to a preamble signal. The preamble signal is provided as a periodic plurality of preamble sequences, each preamble sequence being generated in accordance with: $\frac{1}{32} \sum_{k=0}^{15} b_k b_{k \bmod (k+n, 16)}^*$ $= \begin{cases} 1, n=0 \\ 0, n \neq 0 \end{cases}$. A signal representing the periodic plurality of preamble sequences is sent by a transmitter over the communications channel to a receiver and is received at the receiver as a received signal. The received signal is processed to determine from the received signal both a channel estimate in accordance with:

$\hat{\mathbf{h}} = \frac{1}{64} \mathbf{B}^H (\mathbf{y}_1 + \mathbf{y}_2)$, wherein B represents a matrix of preamble symbol values, upsampled by four and zero-filled, and y1 and y2 are column vectors of received samples, and a baud frequency offset estimate Δf_b in accordance with:

$$S = \sum_{k=0}^{63} y_k y_{k+64}^*$$

$$\Delta f_b \cong \frac{\text{real}(S) \cdot f_b}{\text{imag}(S) \cdot f_c \cdot 32\pi}, \text{ wherein } f_b \text{ is a}$$

baud frequency and f_c is a center frequency of the transmission signal.